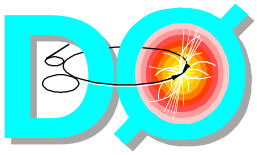
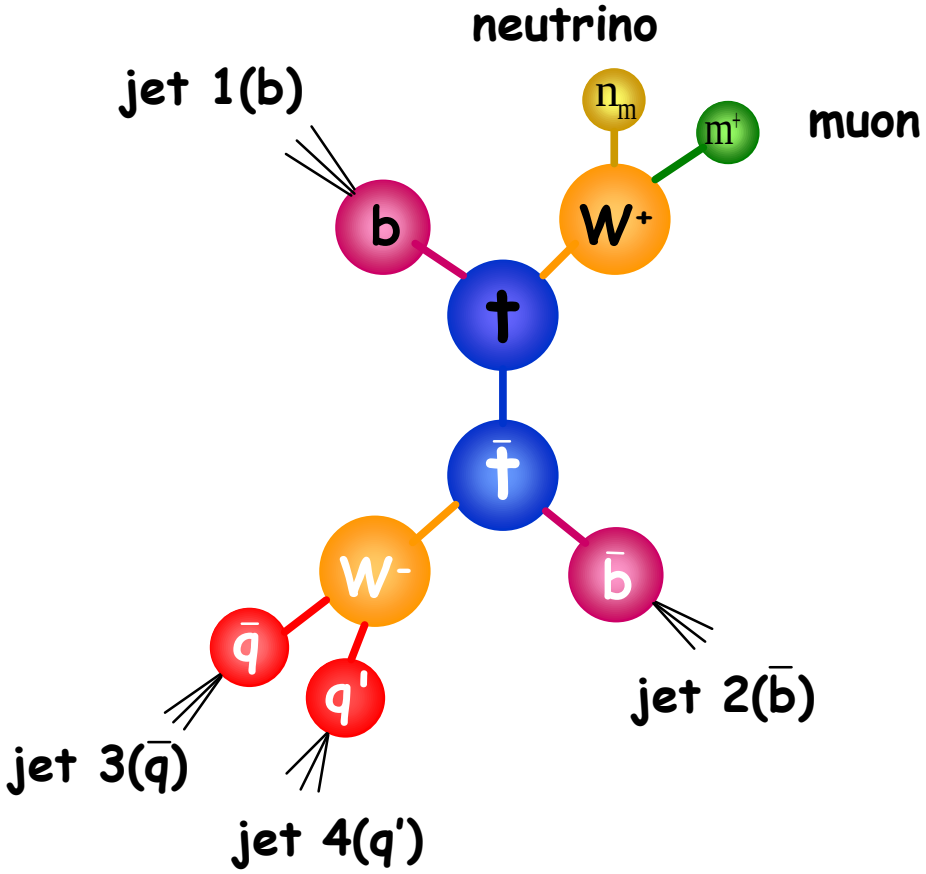


W+Jet Status in the m+jets Channel at DØ

Triggers
Object Identification
Status

Rob McCroskey
University of Arizona
for the
DØ Collaboration

ttbar -> m+jets



- Final state
  - High P_T muon (from W)
  - Missing E_T (from neutrino)
  - Multiple jets (from b-quarks and second W boson decay)

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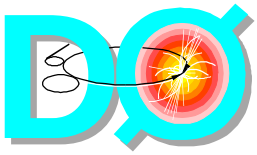
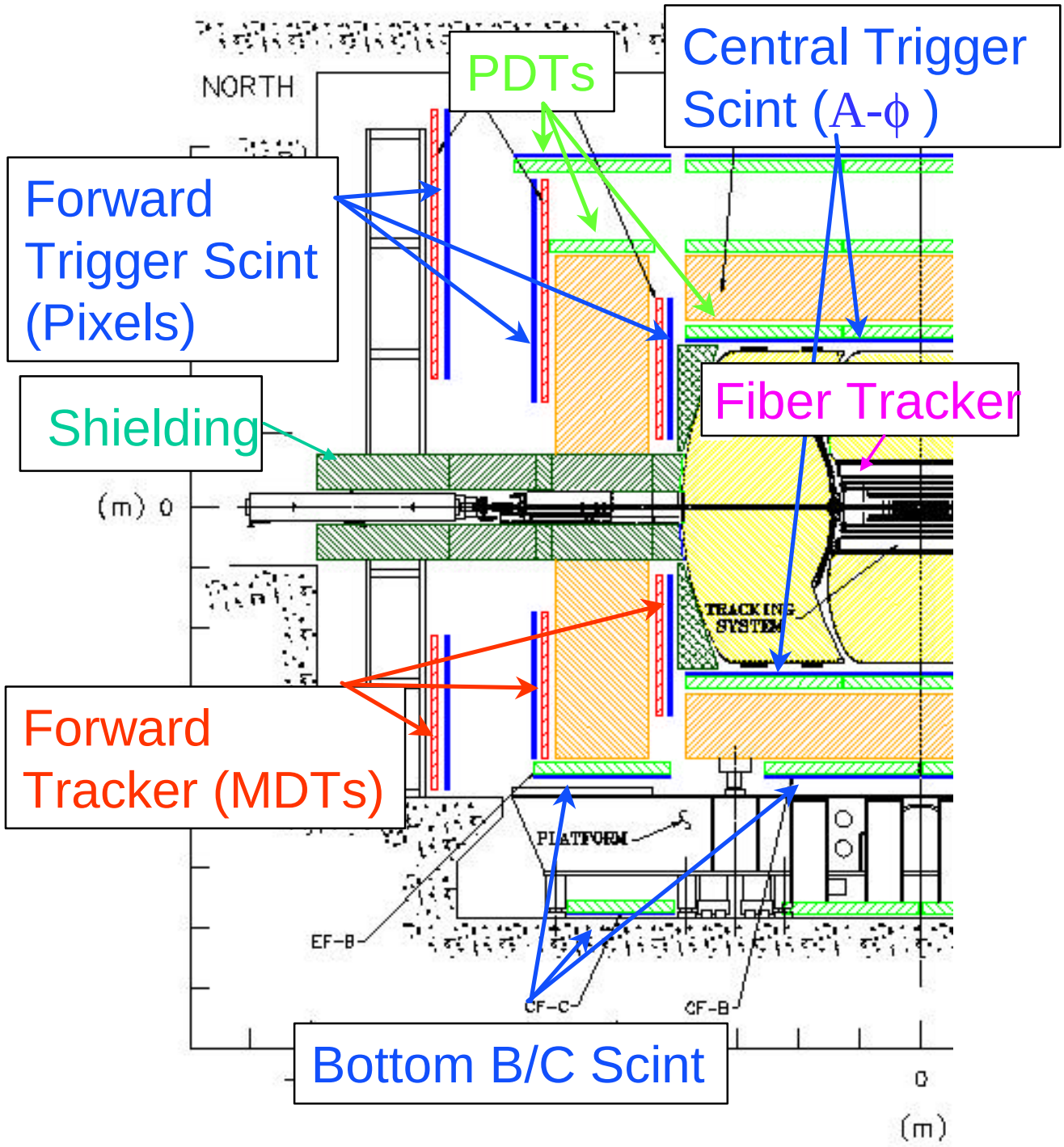


m+jets channel

- ~15% of total ttbar branching fraction
  - Most useful channel, along with electron + jets
- W+jet events are a large source of background to ttbar
- Z+jet events are a good control sample for the W+jets channel
  - Low background
  - No top contribution

DØ Detector



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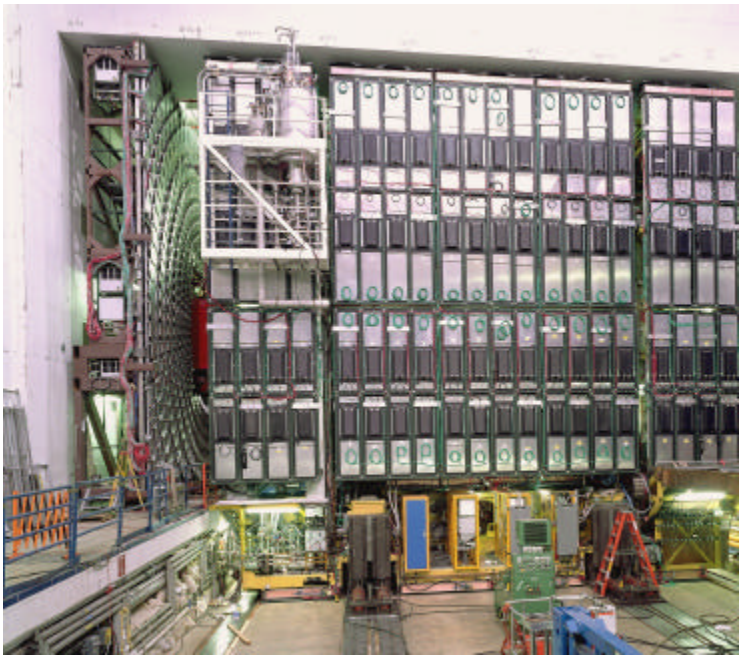
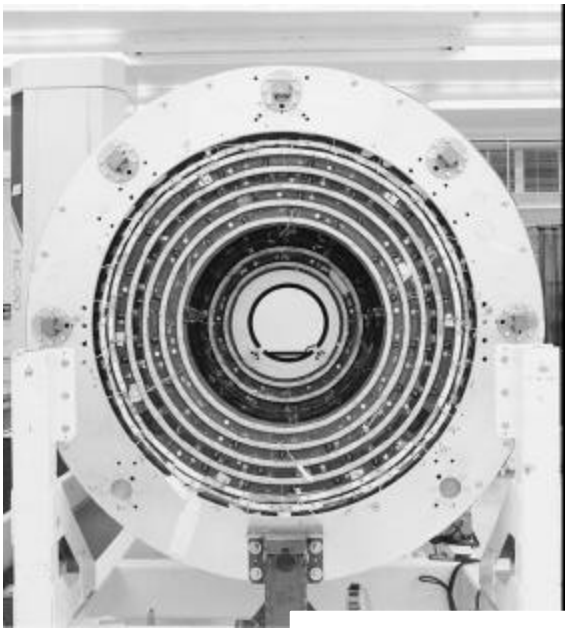
Muon System

Pixel Scintillators



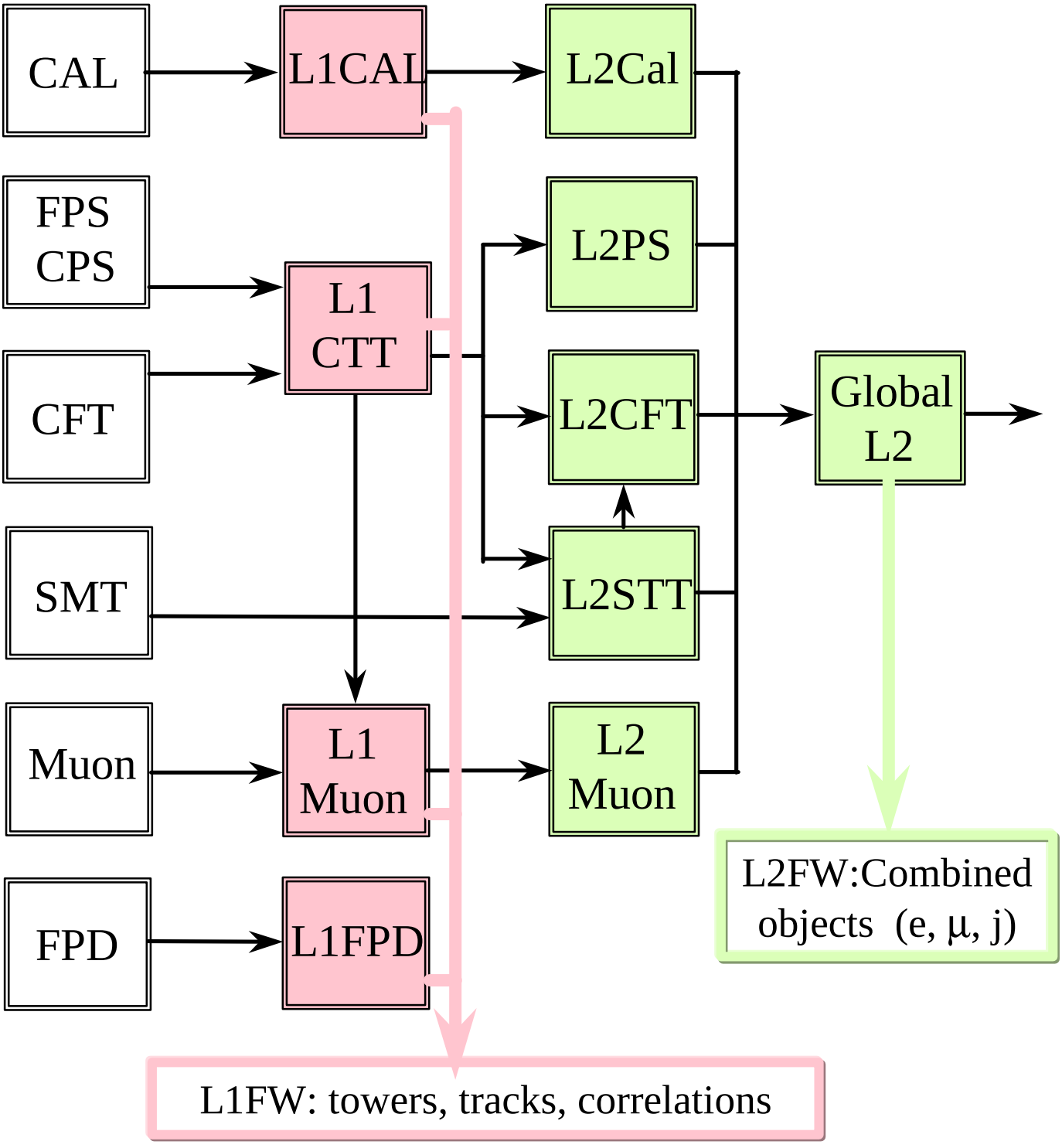
Central Muon System

MDTs



Central Fiber Tracker

DØ Trigger System



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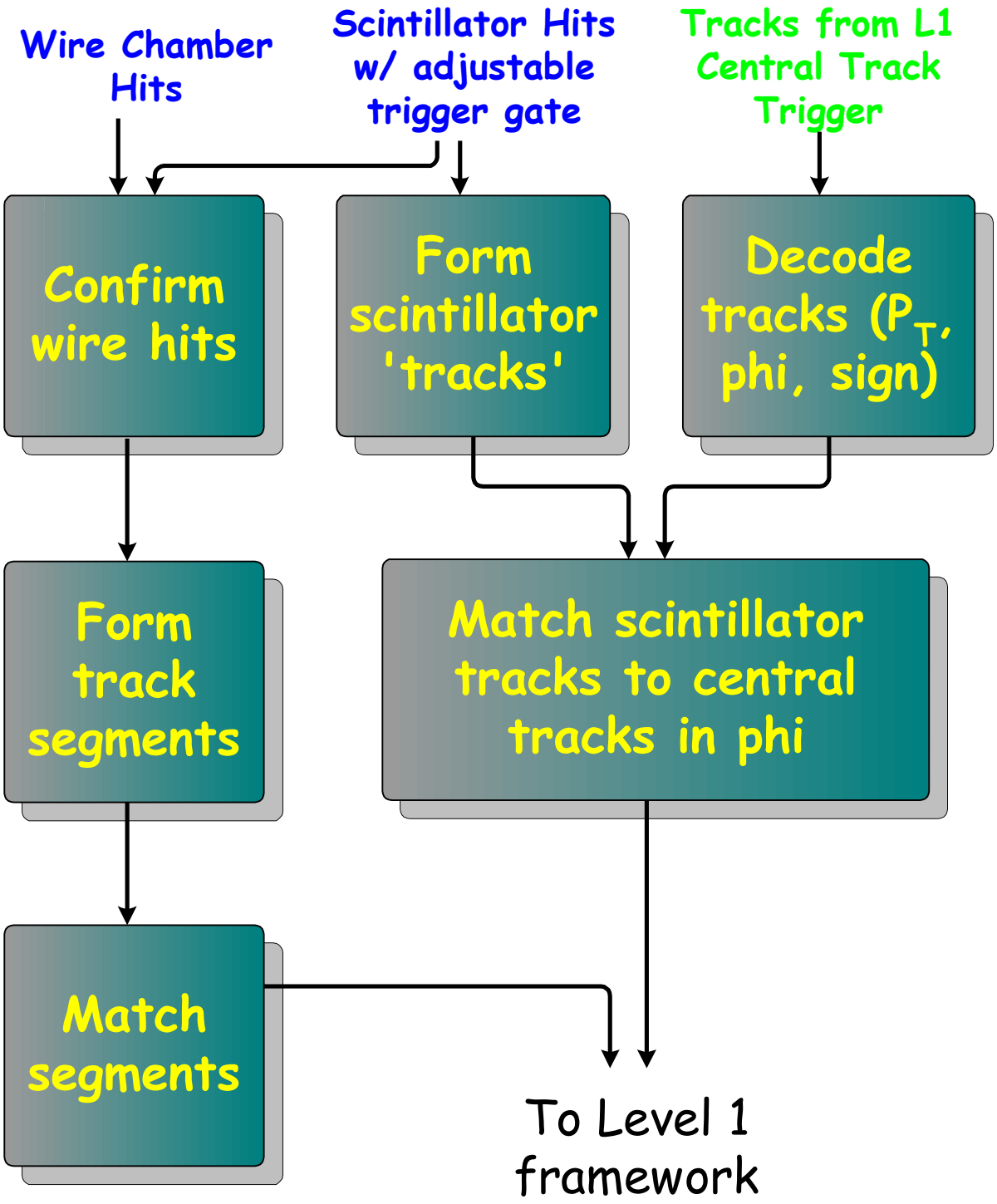
L1 Muon Triggers



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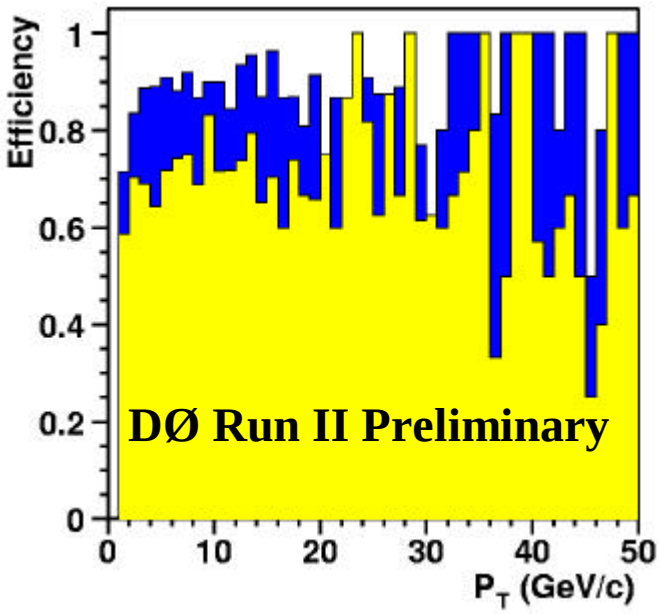
L1 Muon

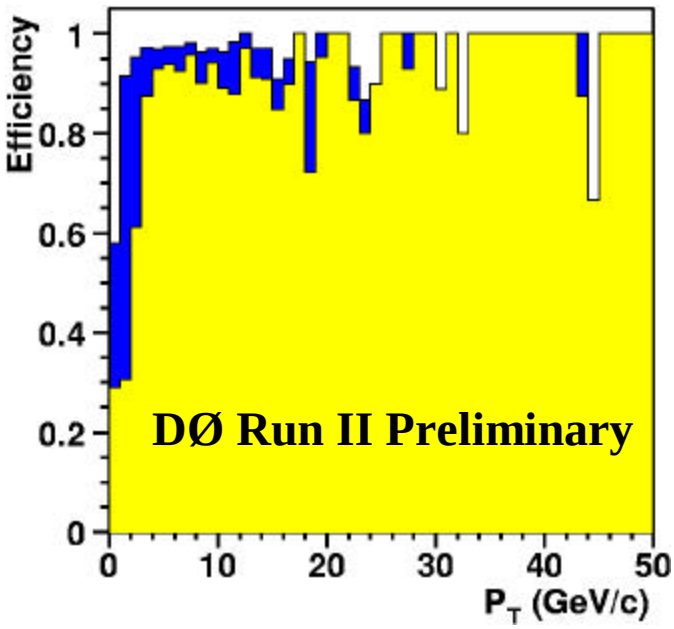
Acc

Eff x Acc

Central



Forward



Rates @L=1x10^{31} cm^{-2}s^{-1}

Central - 325 Hz

Forward - 225 Hz

Scintillator timing gates 30-50ns

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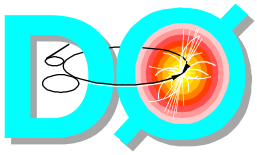

L2 Muon Triggers

- Combination of custom hardware and a processor
- Receives information from all muon front ends and L1 Muon decisions
  - Improved segment finding using wire drift times
  - P_T determination from the drift tubes
  - Improved scintillator timing cuts
- Combination with other detectors is done at L2Global (e.g., central tracks, calorimeter jets)

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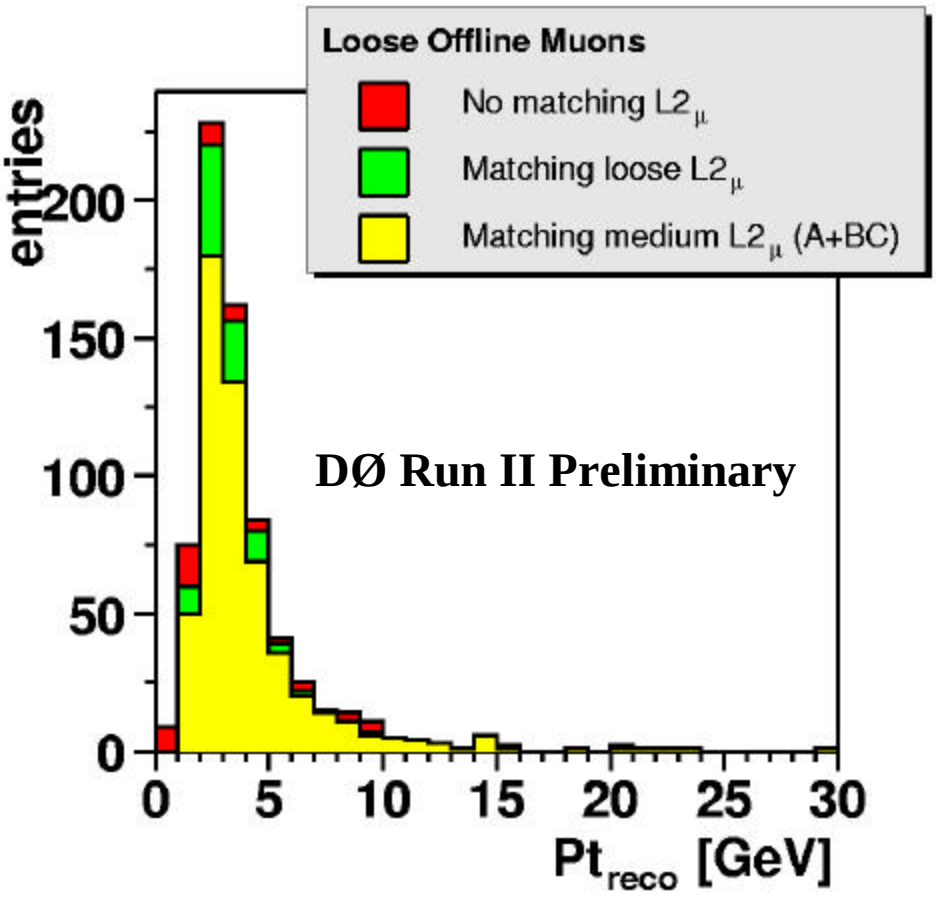
L2 Muon



L2 Efficiency:

	Reconstructed Muon Quality		
L2 Trigger	Loose	Medium	Tight
Loose	97%	99%	99%
Medium	82%	84%	88%

Measured online rejection factor with loose L2 trigger is 1.5 - 2

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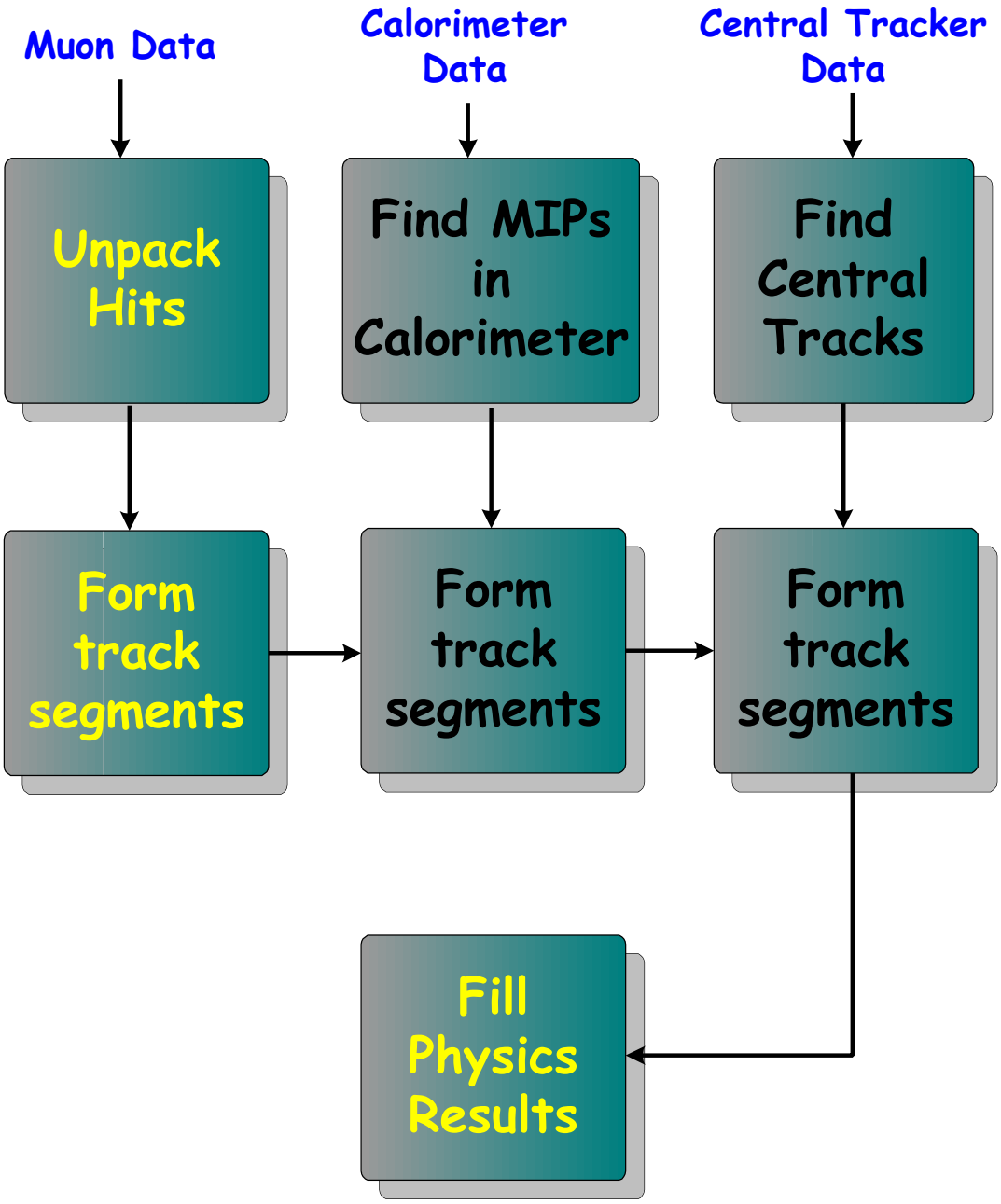
L3 Muon Triggers



Yellow boxes are currently running online

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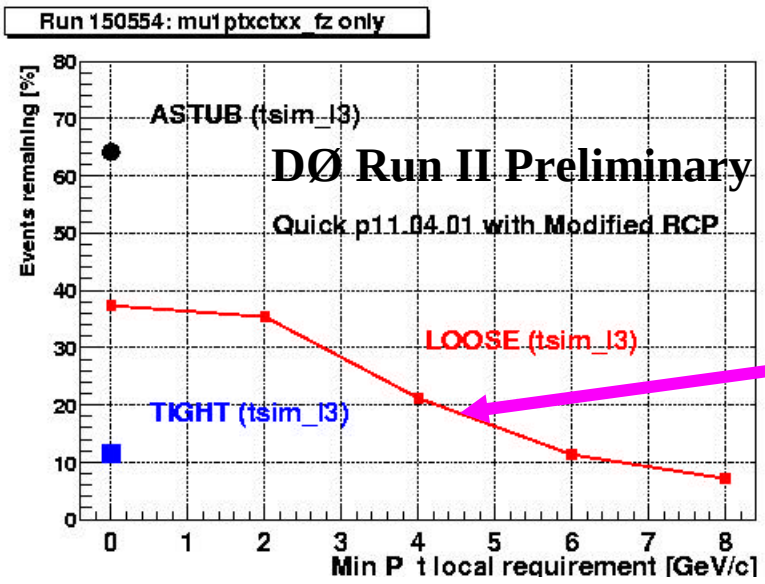
L3 Muon

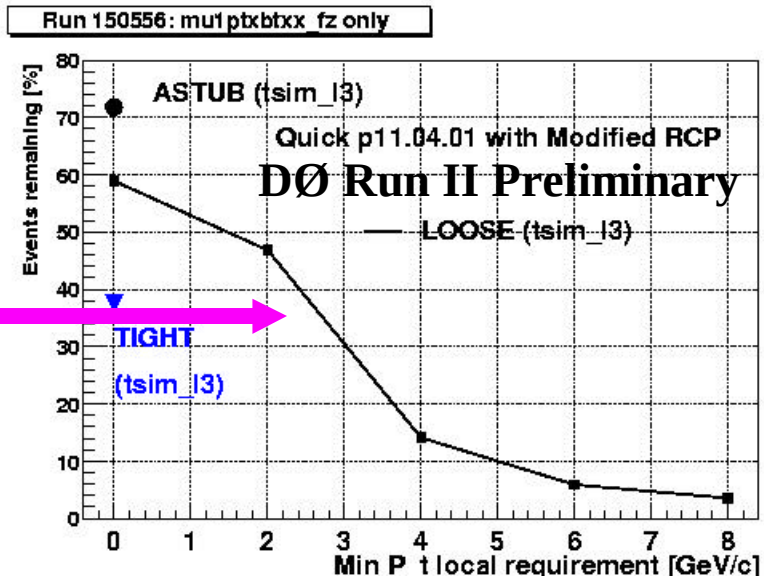
Efficiency for loose muons ~80% in central and forward regions

Central



Central rejection factor of 3-10

Forward



Forward region rejection factor of 2-20

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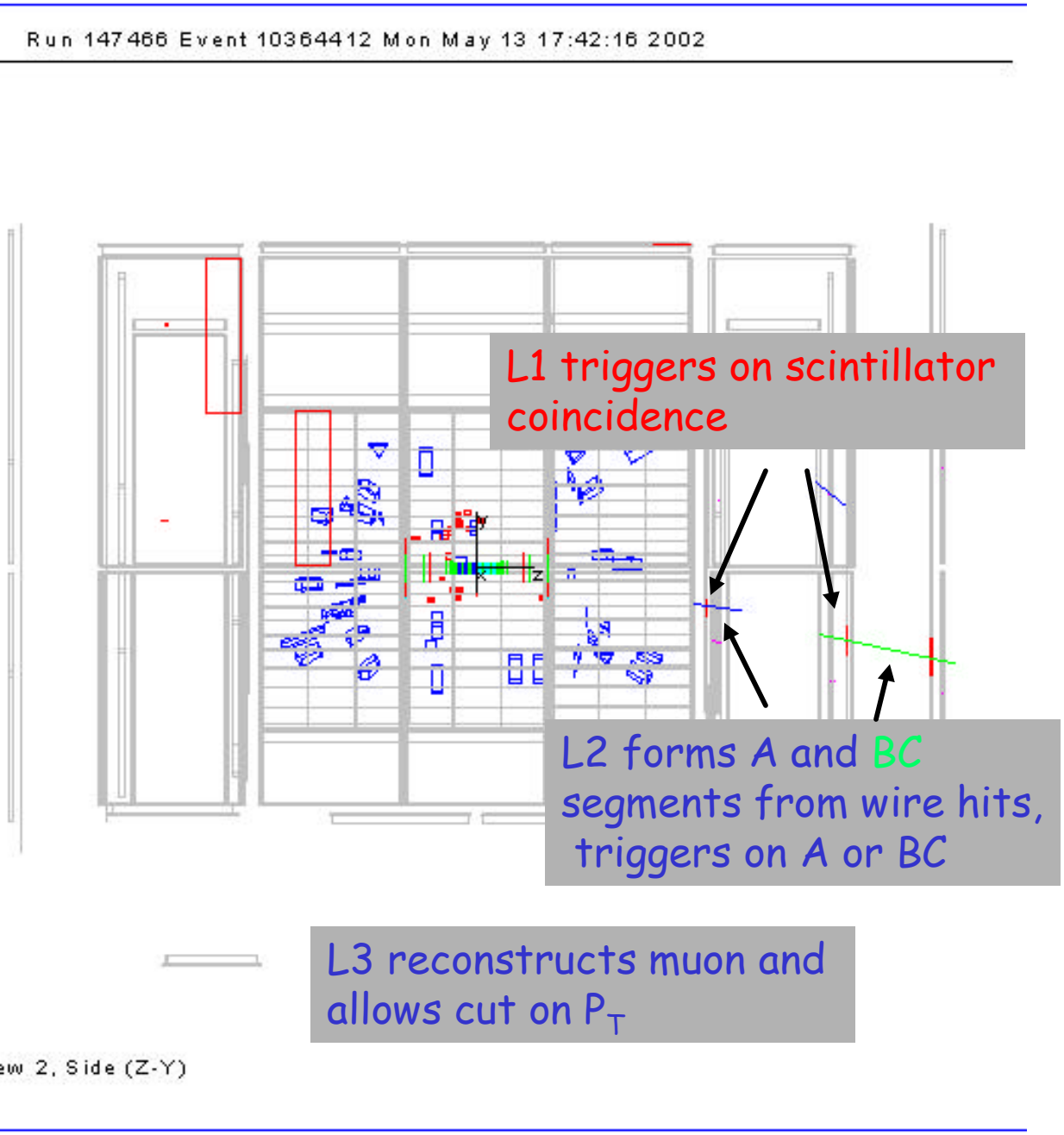
Triggering on Muons



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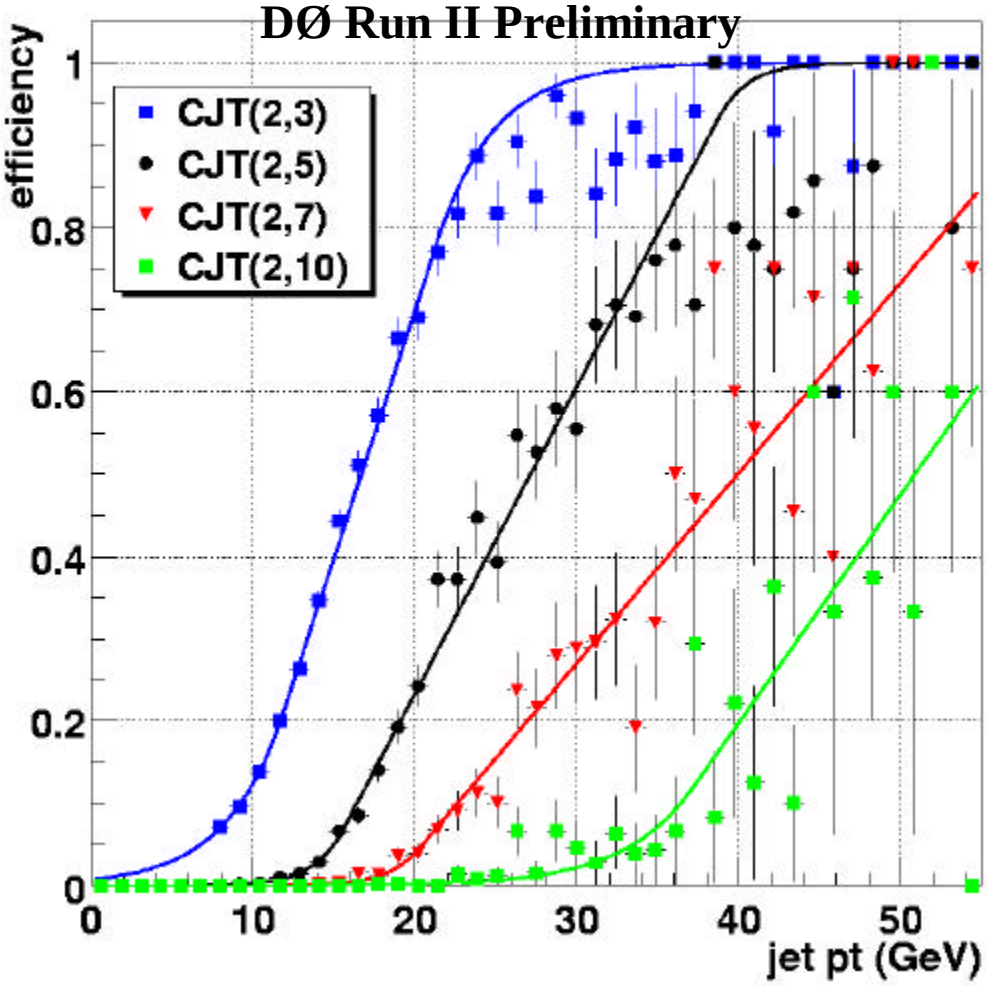
Jet Triggers

- L1 Jet triggers identical to Run I
  - 0.2(h) X 0.2(f) trigger towers are formed for em and em+hadronic sections of calorimeter
  - Triggers based on number of towers above a given threshold and tower region
  - Current jet trigger coverage of $|h|<0.8$
- L2 Cal uses a processor to merge L1 towers into jets
- L3 uses offline reconstruction to form jets
  - Uses precision readout of calorimeter cells
  - Corrects for noisy channels and makes energy scale corrections

Level 1 Jet Trigger



- DR = 0.5 cone jets
- Two towers above 3 GeV is fully efficient for offline jets of ~25 Gev

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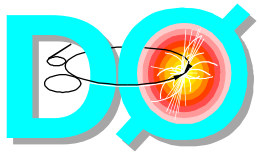

On the Near Horizon

- L1
  - Muon
    - Add L1 Central track match to scintillators
    - Add wire chamber tracks
    - Loosen scintillator requirement
  - Jet
    - Extend eta coverage
- L2
  - Muon
    - Use P_T cut from wire chambers
    - Match L2 muon to central tracks
    - Improve cuts on scintillator timing
  - Jet
    - Add jet requirement
- L3
  - Muon
    - Track, calorimeter matching
  - Jet
    - Number jets

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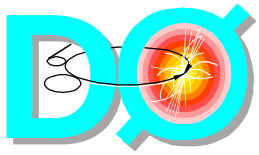

Muon/Jet Identification

- Muons
  - Reconstructed in a series of objects
    - Hits
    - Segments (A, BC)
    - Tracks (A+BC)
  - Match to central track
  - Calorimeter match
- Jets
  - Reconstructed using a $\Delta R = 0.5$ cone
  - Energy Scale
    - Offset energy
    - Calorimeter response
    - Showering

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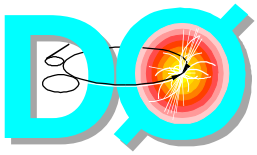

W/Z + Jets

- Online selection
  - Use unprescaled μ+jet, μ+em, and dimuon triggers
  - Integrated luminosity from March to May - ~6 pb^{-1}
- Apply jet energy corrections for jets and missing E_T
- Offline selection
  - W
    - Isolated muon (ΔR>0.5) w/ track match and P_T> 15 GeV/c
    - Missing E_T> 15 GeV
    - Jets with E_T> 10 GeV
  - Z
    - Two isolated (ΔR>0.5) muons w/track match and P_T> 15 GeV/c
    - Jets with corrected E_T> 15 GeV

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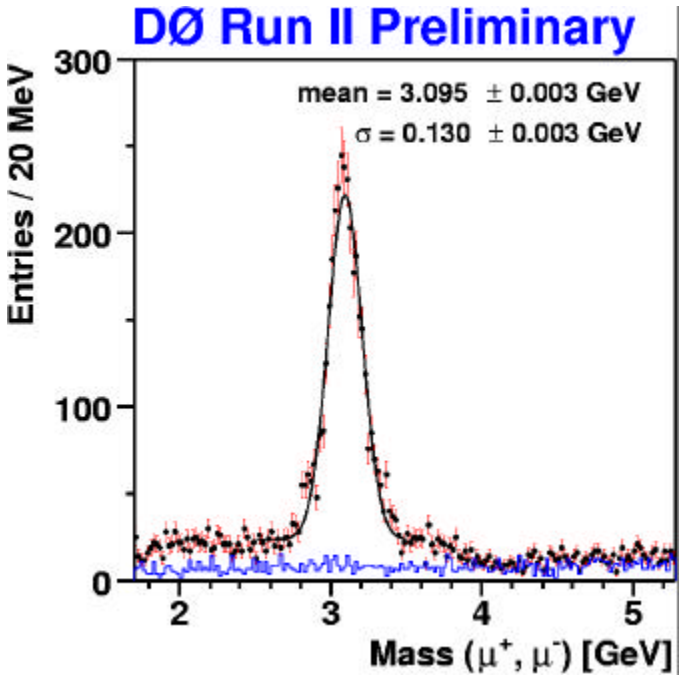
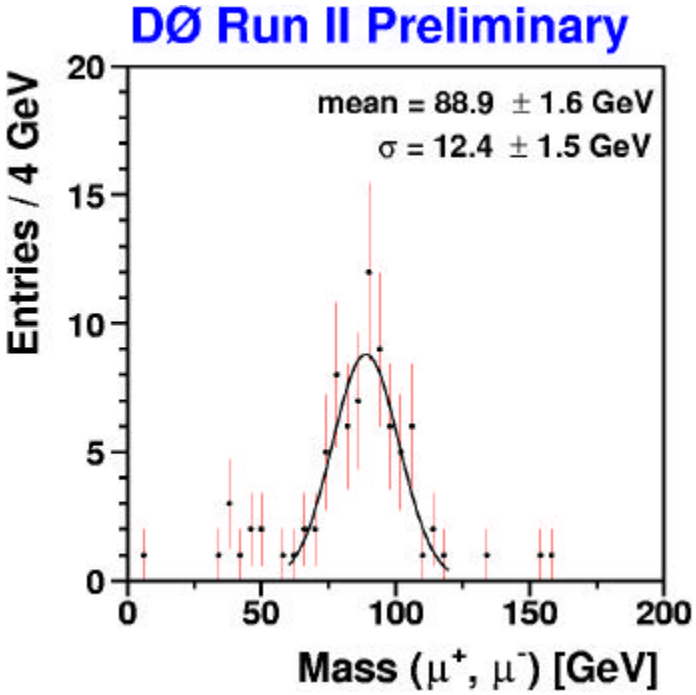
J/Y , Z -> m^+m^-



- Dimuon trigger at L1
- Two muons with matching central track and P_T>2 GeV/c



- Dimuon trigger at L1
- Two muons with matching central track and P_T>15 GeV/c

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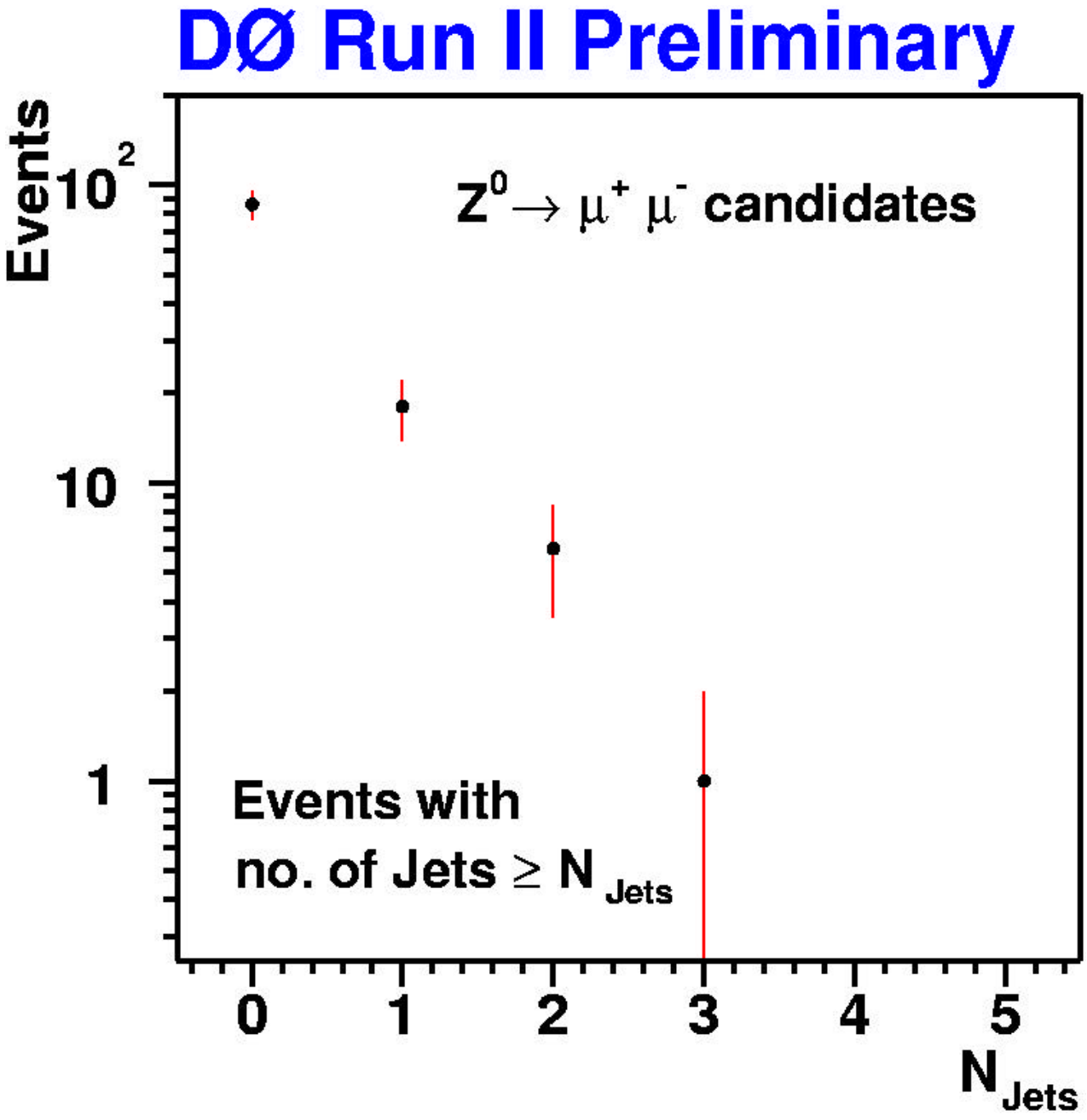
Z + Jets



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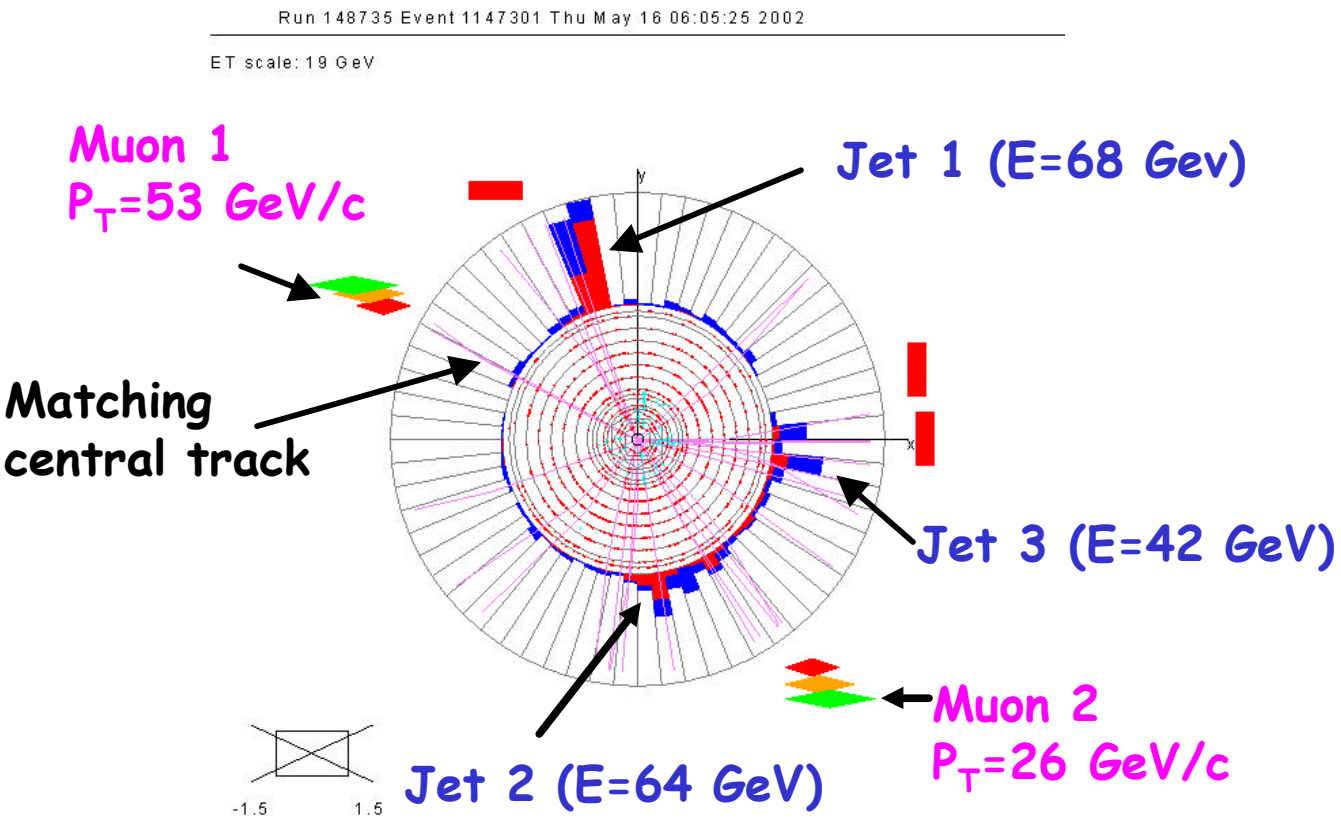
Z+3 Jet Candidate



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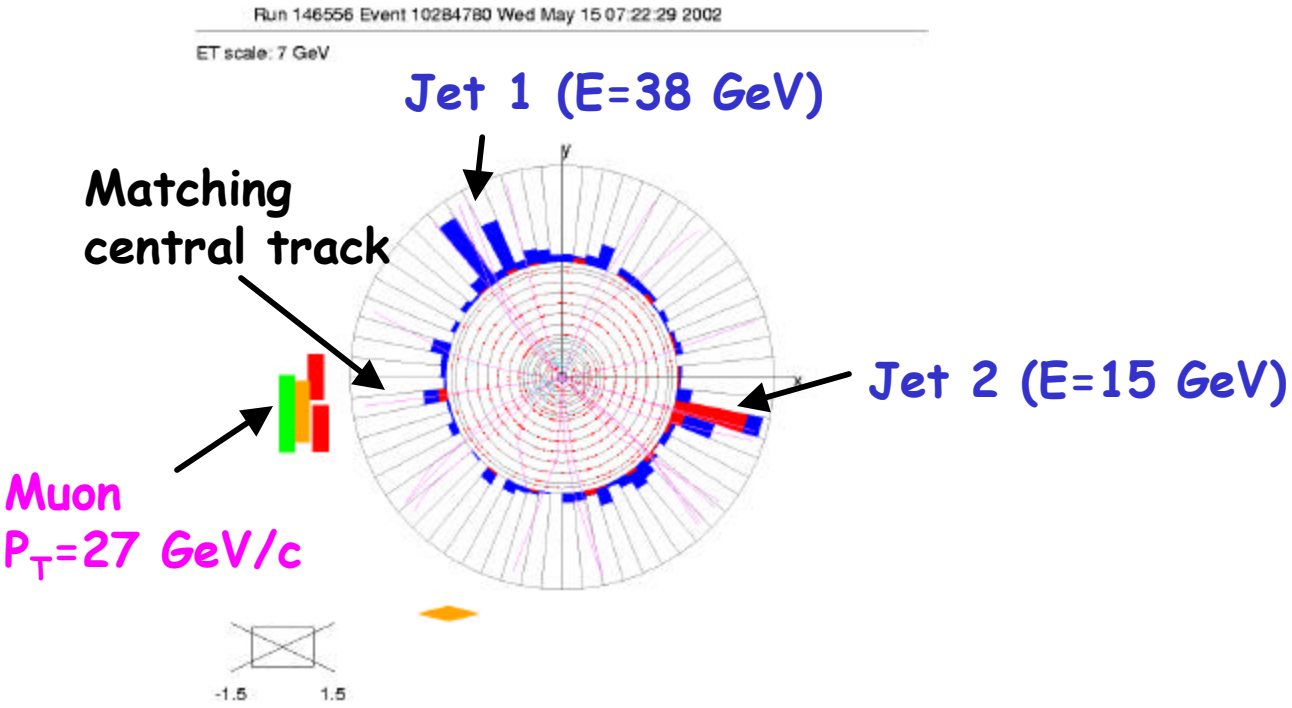
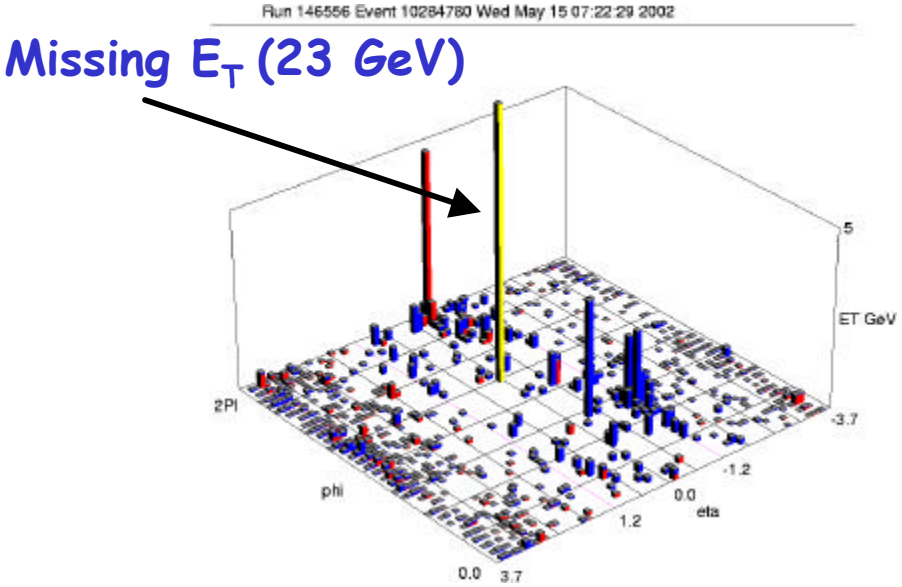
W+Jet Candidate





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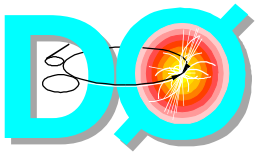

Conclusions

- Triggers
  - L1, L2, and L3 muon and jet are online
  - Efficiencies and rejections measured with data
- Object Identification
  - Improvements continue in matching muons to central tracks
  - J/Psi, upsilon, and Z peaks observed
- W+jet signal
  - Observed in electron channel but just beginninng to emerge in muon channel
  - Work in track matching for muons and background contributions in progress